than 73.0%, a breaking strength of 70-500 Kgf/cm^2 and a breaking extension of 200-800% and having the percolation structure defined in (A) below, as its internal structure:

2. (Amended) The microporous membrane according to claim 1, wherein the average pore size of the surface layer on at least one side of the microporous membrane is the same as or larger than the average pore size of the internal structure.

B1 Cont

3. (Amended) The microporous membrane according to claim 1, wherein the average pore size of the surface layer on at least one side of the microporous membrane is smaller than the average pore size of the internal structure.

REMARKS

Claims 1-4 are in the case. Claims 1-3 are herein amended for the reasons explained below. No new matter has been introduced.

Claim Rejections under 35 U.S.C. §112

Claims 2 and 3 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Specifically, the rejections state that the recitation of "scanning electron microscopy" in each claim "does not add any weight or limitation to the claims, and as such the Examiner suggests delete the pore size measuring method from these claims."

Claims 2 and 3 are herein amended to delete the phrase "measured by scanning electron microscopy" from each claim.

Accordingly, the claim rejections under 35 U.S.C. §112, second paragraph, should be withdrawn.

Claim Rejections under 35 U.S.C. §102

Claims 1-4 are rejected under 35 U.S.C. §102(b) as being allegedly anticipated by *Meguro et al.* (U.S. Patent No. 5,514,461; hereafter "*Meguro*").

Applicants respectfully traverse the rejection.

The microporous membrane of the present invention is prepared by cooling a extruded solution containing a vinylidene fluoride homopolymer or copolymer having a weight average molecular weight of 1x 10^5 or more and a solvent in a weight ratio of 10:90 to 60:40. The process causes crystallization of the homopolymer or copolymer which forms a two-phase gel. The resulting two-phase gel can be treated either by: (i) removing the solvent by the use of a volatile liquid without stretching the shaped product; (ii) before removing the solvent, the shaped product is stretched with a stretching residual strain of 100% or less, and then the solvent is removed by the use of a volatile liquid; or (iii) the solvent is removed by the use of a volatile liquid, followed by stretching with a stretching residual strain of 100% or less (see page 9, lines 7-28 of the specification). Thus, the prepared microporous membrane has a percolation structure with isotropic networks and voids. The ratio of the maximum pore size measured by the bubble point method to the average pore size measured by the half-dry method is 2.0 or less (*see*, for example, page 20, lines 14-23, and claim 1 as amended). The porosity is preferably not more than 80% and not less than 50%. Despite the high porosity and, therefore, high permeability, the membrane of the present invention has an excellent mechanical strength and chemical resistance. Namely, a breaking strength of the membrane is preferably 70 to 500 Kgf/cm^2; a breaking extension preferably 200 to 800%; and a water permeability 200 to 10,000 L/m^2·hr·atm (page 48, line24 through page 49, line 4).

incorrect
assymetric

Megro discloses a polyvinylidene fluoride porous membrane whose pores satisfy the relation, $4.0<P_1/P_2 \leq 10.00$, wherein P_1 is an average pore diameter (μm) in a surface which has a larger average pore diameter, and P_2 is an average pore diameter (μm) in the other surface of the membrane (Abstract and at column 2, lines 42-51). The membrane satisfies the relation, $[TbxEb/(100-\phi)]x100 \geq 1000$, wherein ϕ is the porosity (% by volume), Tb is the tensile strength at break, and Eb is the % elongation at the break point (column 2, lines 57-65). Table 1 at column 8 summarizes the characteristics of the membranes prepared in Examples 1-3. All of the porous membranes prepared in the examples show porosity of ***50% or less***. Furthermore, *Megro* does not specifically describe anything about the ability of the membrane's fluid permeability. Namely, *Megro* does not teach a microporous membrane having a high porosity as well as an excellent permeability for the fluid as in the present invention.

On the other hand, the microporous membrane of the present invention has higher porosity than that in *Megro*. In the Examples, the microporous membrane of the present

invention had a porosity ***not less than 54.0%*** (Example 9 at page 59) and ***not more than 73.0%*** (Example 16 at page 65),

Thus, the microporous membrane of the present invention is distinct from that of *Megro* and is not anticipated by the latter. To make this distinction clear, claim 1 is herein amended to recite that the porosity is not less than 54.0% and not more than 73.0%, a breaking strength is 70-500 Kgf/cm^2, and a breaking extension is 200-800%.

Accordingly, Applicants respectfully request that the rejection of claim 1 under 35 U.S.C. §102(b) be withdrawn.

Claim Rejections under 35 U.S.C. §103

Claims 1-4 are rejected under 35 U.S.C. §103(a) as being allegedly unpatentable over *Megro*. Specifically, the rejection states as follows:

> The reference is again relied upon substantially as set forth above. For claims 1-4, if, for the purpose of anticipation, the reference is believed to teach such a number of different embodiments that the specific parameters of each of the claims cannot be considered to be in possession of the skilled artisan, the Examiner believes that, alternatively, each of the claimed embodiments is at most a minor modification to one of ordinary skill. Note particularly that in the absence of unexpected results, it would have been obvious to one of ordinary skill in the art to modify *Meguro*'s polyvinylidene fluoride porous membrane with a suitable plasticizer and solvent system and surface cooling process, motivated by the desire to achieve a suitable average pore size in specific regions, as taught by *Megro*."

Applicants respectfully disagree with this statement.

The microporous membrane of the present invention having the characteristics discussed above is made possible by using a vinylidene fluoride homopolymer or copolymer having a weight average molecular weight of 1×10^5 or more; dissolving the polymer in a specific solvent at a specific temperature; employing a specific cooling method; and optionally stretching the resulting gel-like product with a stretching residual strain of 100% or less (*see* page 7, line 21 through page 14, line 8, and Examples). Such specific condition under which the microporous membrane of the present invention is prepared, are more than "a minor modification" to the membrane of *Megro* as the resulting membrane exhibits superior porosity and fluid permeability, without losing its mechanical strength and chemical resistance, over *Megro*'s membrane.

Megro's membrane has a ratio of the maximum pore diameter P_4 measured by a bubble point method to the mean flow pore diameter P_3 measured by a half dry method being not more than 2.0. *Megro*'s membrane also has high tensile strength at break (breaking strength) and high elongation at the break point (breaking elongation). However, as discussed in the previous section, *Megro*'s membrane has relatively poor porosity (*i.e.*, 31% in Example 1, 37% in Example 2, and 50% in Example 3, which is the maximum) to that of the membrane of the present invention. In other words, *Meguro* does not teach porous membranes having more than 50% porosity. Furthermore, *Megro* does not disclose anything about the relationship between the water permeability and the porosity as well as mechanical strength of the membrane.

In contrast, the microporous membrane of the present invention has a high porosity while keeping high breaking strength and high breaking elongation. Such a characteristic makes it possible to run the fluid at high permeation of 200 to 10,000 $L/m^2 \cdot hr \cdot atm$. Thus, the microporous membrane of the present invention can have a homogeneous structure with the specific parameters recited in amended claim 1, and therefore, has an excellent efficiency in separating fine particles from a fluid without sacrificing the mechanical strength and chemical resistance. Accordingly, the present membrane is especially preferable in filtration applications, such as virus-removing filters, ultrafiltration membranes, microfiltration membranes, separators for batteries, diaphragms for electrolytic capacitors and the like. In this respect, the present invention has an unexpectedly superior effect over the prior art and, hence, has an inventive step.

Claim 1 is herein amended to recite specific characteristics of the membrane in terms of porosity and mechanical strength that gives an excellent fluid permeability to the microporous membrane of the present invention, which is not taught by *Megro*. Thus, claim 1 is not obvious over the membrane of *Megro*.

Accordingly, Applicants respectfully request that the claim rejection under 35 U.S.C. §103(a) be withdrawn.

Favorable consideration of the application in view of the above amendments is hereby respectfully requested.

No fee, other than the extension fee, is believed to be due for this amendment. Should any fee be required, please charge such fee to Deposit Account No. 16-1150.

Respectfully submitted,

Date: March 27, 2003

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Attachments: Exhibits A and B.

EXHIBIT A

MARKED-UP VERSION OF AMENDED CLAIMS

Filed March 27, 2003

Application Serial NO.09/646,527 (Filed September 15, 2000)

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1. (Amended) A microporous membrane produced by cooling a solution comprising a vinylidene fluoride homopolymer or copolymer having a weight average molecular weight of 1 x 10^5 or more and a solvent therefor, to form a two-phase gel, said microporous membrane comprising a polymer phase comprising said vinylidene fluoride homopolymer or copolymer, and intercommunicating voids which have an average pore size measured by the half-dry method of 0.005 to 5 μm and extend from one side of the membrane to the other side, and said microporous membrane having **a porosity of not less than 54.0% and not more than 73.0%, a breaking strength of 70-500 Kgf/cm^2 and a breaking extension of 200-800% and having** the percolation structure defined in (A) below, as its internal structure:

(A) a structure in which the polymer phase forms an isotropic network structure by three- dimensional branching in arbitrary directions, the voids are formed within an area surrounded by said polymer phase of the network structure and intercommunicate with one another, and the ratio of the maximum pore size measured by the bubble point method to the average pore size measured by the half-dry method is 2.0 or less.

2. (Amended) The microporous membrane according to claim 1, wherein the average pore size **[measured by scanning electron microscopy]** of the surface layer on at least one side of the microporous membrane is the same as or larger than the average pore size **[measured by scanning electron microscopy]** of the internal structure.

3. (Amended) The microporous membrane according to claim 1, wherein the average pore size **[measured by scanning electron microscopy]** of the surface layer on at least one side of the microporous membrane is smaller than the average pore size **[measured by scanning electron microscopy]** of the internal structure.

EXHIBIT B

A LIST OF PENDING CLAIMS UPON ENTRY OF THE PRESENT AMENDMENT
Filed March 27, 2003
Application Serial NO.09/646,527 (Filed September 15, 2000)

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1. (Amended) A microporous membrane produced by cooling a solution comprising a vinylidene fluoride homopolymer or copolymer having a weight average molecular weight of 1×10^5 or more and a solvent therefor, to form a two-phase gel, said microporous membrane comprising a polymer phase comprising said vinylidene fluoride homopolymer or copolymer, and intercommunicating voids which have an average pore size measured by the half-dry method of 0.005 to 5 μm and extend from one side of the membrane to the other side, and said microporous membrane having a porosity of not less than 54.0% and not more than 73.0%, a breaking strength of 70-500 Kgf/cm^2 and a breaking extension of 200-800% and having the percolation structure defined in (A) below, as its internal structure:

(A) a structure in which the polymer phase forms an isotropic network structure by three- dimensional branching in arbitrary directions, the voids are formed within an area surrounded by said polymer phase of the network structure and intercommunicate with one another, and the ratio of the maximum pore size measured by the bubble point method to the average pore size measured by the half-dry method is 2.0 or less.

2. (Amended) The microporous membrane according to claim 1, wherein the average pore size of the surface layer on at least one side of the microporous membrane is the same as or larger than the average pore size of the internal structure.

3. (Amended) The microporous membrane according to claim 1, wherein the average pore size of the surface layer on at least one side of the microporous membrane is smaller than the average pore size of the internal structure.

4. The microporous membrane according to claim 1, wherein the average pore size measured by the half-dry method is 0.005 to 0.1 μm.